

REMARKS

The present response is responsive to the Examiner's concerns noted in the Office Action.

Summary of the Response

Claim 52 has been amended. Claims 27-52 remain pending in this application. Reexamination and reconsideration of the present application as amended are respectfully requested.

Telephone discussion with Examiner

Applicant is grateful for the courtesy extended by the Examiner of an opportunity to briefly discuss the present application by telephone. Applicant's representative spoke with the Examiner on May 3, 2006, with the original intent to schedule a telephonic interview with the Examiner for the present application. The call extended into a short informal discussion of the cited prior art and the claims, and after-final practice. No agreement has been reached. However, it was clear from the short discussion that the Examiner construed recesses disclosed in the prior art to correspond to "convex" structures. This issue will be addressed in detail below.

Summary of the Invention

The present invention is directed to a light coupling structure on a light guide plate in a backlight module, which is structured to work with a two-dimensional (i.e., planar) array of point

light sources at one planar surface of the light guide plate, such as those used in an LCD display. This particular type of light guide is distinguished from the edge-lit type of light guide, for which a linear light source is provided at the edge of the light guide plate. Edge-lit type light guide is designed for use to reduce the overall thickness of the backlight module, because there are no light sources provided on the planar side of the backlight module. However, the two-dimensional planar area of point light sources provide relatively brighter and more even distribution of light for the backlight module, as compared to an edge-lit backlight module in which light has to make its way from the side light source, to be distributed across the top light emitting planar surface. In order to improve even distribution of light over the planar output surface of an edge-lit light guide plate, it is designed to reflect and scatter light from the planar surfaces in the viewing path of the illuminated object. As such, the design considerations of an edge-lit light guide plate is different from the design considerations of a backlit in many respects.

The light coupling structure comprises a two-dimensional array of protruding or convex structures that extend from a planar surface of the light guide plate, wherein each convex structure is aligned with a point light source (i.e., a two dimensional array of point light sources). The convex structures more effectively diffuse the light from the point light source into the light guide plate, to achieve a more uniform light distribution across the entire light emitting surface of the light guide plate. More particularly, in the disclosed and illustrated embodiment, the convex structure has a proximal end portion and a distal end portion directly facing a corresponding point light source, and the cross-section of the convex structure reduces in area from the proximal end portion to the distal end portion. Further, the point light source is juxtaposed to the distal end portion of the convex structure. This structure facilitates guiding of light from the light source to the light into (not from) the light guide plate, to be emitted from the

light emitting surface. Light emitted from the point light source is substantially received through the convex structure. Embodiments of the protruding and extended convex structure include frustum or truncated cone shape.

In a further embodiment, the convex structure has a recess within the convex structure, which recess is directly facing a point light source, so as to receive at least a portion of the point light source.

In the context of an LCD device, the backlight device of the present invention is deployed to illuminate an LCD panel. The LCD panel is positioned relative to the light emitting surface of the backlight device, wherein the light emitting surface on the other side of the surface on which the convex structures are present to couple input light from the point light sources.

Claim Rejections Under 35 USC 102(e)

Claims 27-29, 36, 37, 45 and 49-52 are rejected under 35 U.S.C. 102(e) as being anticipated by Chuang et al., (Chuang), US 2004/0130515. This rejection is respectfully traversed for the reasons below.

On the outset, it is noted that Chuang is applied as a 102(e) reference. Given the traversal of Chuang herein, Applicant would not need to comment on the possibility of "swearing behind" this reference. Applicant reserves the right to do so at a later time if it becomes necessary.

Chuang does not disclose convex structures on its light guide plate, in the context of the term "convex" as used herein. Applicant is entitled to be its own lexicographer, which in this case, "convex" as reasonably interpreted in light of the disclosure of the present invention, consistently refers to a structure that extends from the "first surface" of the light guide plate.

Chuang instead discloses recesses that are concave structures on a light guide plate, based on a reasonable interpretation, and within the context of the disclosure of the present invention. The Examiner apparently appreciates this distinction, since the Examiner did not apply Chuang to anticipate dependent claim 30 (depending directly from independent claim 27), which more specifically define the "first surface" to be a "planar surface" from which the "convex structures" extend. It is further noted that in the further disclosed embodiment shown in Fig. 5b, the convex structure includes a recess within such structure. This demonstrates that the distinction between a convex structure and a recess structure is clear and consistently presented in the disclosure of the present invention. Further, there is no support in the specification of the present invention of a "convex structure" that is a recess only structure in the absence of a protruded or convex structure. Therefore the term "convex structure" may not be reasonably construed to mean a recess structure, which would have been a concave structure as opposed to a convex structure.

Accordingly, independent claim 27 is not anticipated by Chuang for failure to disclose a "convex structure".

Similarly, independent claim 51 is not anticipated by Chuang. Claim 51 specifically recites a two dimensional array of "protrusions" on the "first surface", each protrusion aligning with a pointed light source. There are no protrusions in Chuang, which are respectively aligned with the point light sources. Applicant notes that the Examiner commonly referred to "convex structures" when considering independent claim 51. However, claim 51 does not recite "convex structures". The Examiner is respectfully requested to withdraw the rejection of claim 51, or set forth the correct basis for rejecting claim 51 based on anticipation by Chuang.

Accordingly, all dependent claims, including claims 28, 29, 36, 37, 45, 49, 50 and 52, which depend directly or indirectly from claims 1 and 51, are likewise not anticipated by Chuang.

Claim Rejections Under 35 USC 103(a)

a. Chuang

Claims 39-44 and 46-48 are rejected under 35 U.S.C. 103(a) as being obvious over Chuang. This rejection is respectfully traversed.

As the Examiner noted in the Office Action, Chuang has a common assignee with the instant application. Applicant respectfully submits that, at the time the present invention was made, the subject matter disclosed in Chuang and the presently claimed invention were owned by the common assignee, Toppoly Optoelectronics Corp. Pursuant to their employment agreements then in place with the common assignee at the time of the present invention, the inventors of the present application and Chuang were obligated to assign, and had in fact assigned by operation of such employment agreements, their respective inventions to the common assignee. Accordingly, pursuant to 35 USC 103(c), Chuang, being a 102(e) prior art, would not preclude patentability under 103(a).

The obviousness rejection of claims 39-44 and 46-48 are therefore traversed. In fact, none of the claims pending in the case can be deemed obvious over Chuang.

b. Funamoto + Yokoyama + Cho

Claims 27-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Funamoto et al., (Funamoto), US 2003/0206408 in view of Yokoyama, US 2003/0147055 and further in view of Cho et al., (Cho), KR 2002071358. This rejection is respectfully traversed.

As the Examiner noted in the Office Action, Funamoto does not disclose a two-dimensional array of point light sources. Further, the Examiner noted in the Office Action that Funamoto does not disclose each convex structure being aligned with a point light source.

Funamoto is directed to a light guide that is designed for top illumination of the front face of an illuminated object (see Abstract in Funamoto), as opposed to a backlight light guide. The illuminated object is viewed through the light guide plate. Consequently, the light source in Funamoto cannot be on any of the planar side of the light guide plate, which would block the view of the object. This characteristic of the Funamoto light guide cannot and should not be ignored in the obviousness inquiry herein.

Contrary to the Examiner's assertion in the Office Action, it would not have been obvious to one skilled in the art at the time of the invention was made to modify the Funamoto's light guide structure in view of Yokoyama and Cho, in order to obtain the inventive backlight device in which a two-dimensional array of point light sources is aligned with convex structures or protrusions on the first surface (i.e., the surface facing the point light sources, or the light input side) of the light guide plate (as required by independent claims 1 and 51), where light from the two-dimensional array of point light sources are guided into the light guide plate to be emitted from a second surface (i.e., the light output side).

The prior art references do not contain any suggestion (express or implied) that they be combined, much less that they be combined in the manner suggested by the Examiner. The

references take completely different paths and reach different solutions to different design objectives. As noted above, Funamoto is concerned with the design of an effective light guide plate for top illumination and viewing of a target object. Funamoto specifically adopted an edge-lit light guide structure that includes optical extraction projections facing the side of the viewed object, so that light can be better projected onto the viewed object. Funamoto designed its light guide plate to reflect light from the light source to reflect from the top surface of the light guide plate to the projections facing the object to be illuminated. Referring to Fig. 2A in Funamoto, to achieve its intended top illumination light guide plate design, Funamoto transmits light in its light guide plate 11 from a source 2 at an edge of the light guide plate 11. The light is directed to be projected via optical extraction structures (e.g., pillar-shaped projections 12) provided on a planar output surface 13 that faces a targeted object 6. The top surface 17 of the light guide plate 11 reflects light from the light source 2 to the projections 12 at the bottom surface facing the object 6. The light source 2 is strategically placed at the edge of the light guide plate 11, for at least the reason not to block the view of the illuminated body 6 through the light guide plate 11. For at least this reason, Funamoto avoided positioning the light source 2 on any planar side of the light guide plate 11, and certainly not on the same side as the projected optical extraction structures 12.

Yokoyama is directed instead to a light source device to provide illumination in an LCD projector. Referring to Figs. 1 and 2 in Yokoyama, it specifically adopted a hollow light-guiding block 10, formed from a plurality of reflective wall surfaces 11 (formed by vapor depositing thin metal films or laminating reflective films). Light from the LED array 20 is uniformly mixed while reflecting from the inner wall surfaces (the reflective surfaces 11), and such is directed to the output end face opposite the LED array 20. It is noted that the light-guiding block 10 does

not transmit light through the light guiding block or through its walls to the target object. Therefore, the light guiding block of Yokoyama is a completely different type of light guide as compared to Funamoto (i.e., a reflective type light guide in Yokoyama, versus a transmissive type light guide in Funamoto.) It is further noted that the light source device in Yokoyama is intended to replace a lamp in a projector. Hence, it has an axially symmetric structure, including the two-dimensional LED array, to provide a uniform and symmetrical light source for projection. Accordingly, Yokoyama is directed to a completely different, non-analogous, structure compared to Funamoto. The reason for having a two-dimensional LED array in Yokoyama is therefore not applicable to Funamoto.

Even if Yokoyama is deemed to show point light sources in an analogous light guide structure, there is still no reason to have point light sources aligned with Funamoto in the first place, particularly given Funamoto's disclosed design objectives. In fact, Funamoto effectively teaching away from using a two-dimensional array of point light sources, since its objective is to provide a thin light guide structure, using a linear array of light sources at a thin edge of its light guide plate. To use a two-dimensional array of point light sources would frustrate the Funamoto's specific design objectives. In the present obviousness inquiry, one cannot simply ignore what is specifically disclosed in Funamoto, in an attempt to modify the specific disclosed structure using hindsight reconstruction, in a manner made possible only by the disclosure of the present invention. There is simply no reason to combine Funamoto and Yokoyama, and in fact good reasons as stated above not to combine these references in the manner proposed by the Examiner.

The Examiner further relied on Cho, alleging that Cho discloses alignment of light source with convex structure of the light guide. Cho instead is directed to a light guide plate in which

the light source is provided at a planar surface, which is along the viewing direction. As Applicant noted above in connection with Funamoto, there is no motivation or desirability to modify Funamoto, which can be gleaned from Funamoto or any of the secondary references for that matter, to have point light sources on either planar side of the Funamoto light guide plate, and certainly not on the planar side with the projected optical extraction structures. The Funamoto light guide plate is of the edge-lit type, designed to facilitate directing light from a light source at the edge, through the light guide plate to an object via the optical extraction structures or projections. If Funamoto is somehow modified to include point light sources facing and aligned with such projections, it would not have made sense, because light would be entering through the projections into the light guide plate, away from the object intended to be illuminated by the light guide plate. Applicant further notes that with respect to claim 49, which more specifically requires that the light emitted from the light emitting surface is received by an LCD panel positioned relative to the light emitting surface (i.e., the second surface: not the first surface on which the convex structures are present).

In accordance with MPEP §2143.01, the combination proposed by the Examiner cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. The proper test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered.

to the extent that they are in analogous arts. Where the teachings of two or more prior art references conflict, the examiner must weigh the power of each reference to suggest solutions to one of ordinary skill in the art, considering the degree to which one reference might accurately discredit another.

Even if Cho is deemed to show alignment of light sources with each convex structures of a light guide, the light sources in Cho are not in a two-dimensional array. (Please see further explanations in Applicant's response to the previous Office Action.) Further, the light guide in Cho does not have a two-dimensional array of convex structures. The light guide plate has at most a linear arrangement of convex surfaces 111 that each receives a longitudinal fluorescent lamp tube. The light guide plate in Cho is specifically designed to accommodate linear lamp tubes as light sources, not a two-dimensional array of point light sources. There is no teaching in Cho that its one-dimensional array of convex surfaces in its light guide structure can and should be used with a two-dimensional array of point light sources. Cho lacks any suggestion that the lamp tubes can and should be modified with point light sources, such as LEDs. For example, there is no indication anywhere in Cho that the light guide panel 12 with grooves would be suitable for use with a two dimensional array of point light source. The light guide panel 12 provides reflective surfaces at the bottom of the light guide panel 12, to direct light from the linear fluorescent lamps 10 in the grooves towards the top light emitting surface. It appears that this specific light guide plate structure would only be suitable for a linear array of linear lamps, not a two dimensional array of point light sources required by the claimed invention. To otherwise apply Cho in the manner suggested only by the Examiner would require a modification which is still missing from the cited references, in addition to the missing suggestion, motivation

or desirability necessary to make such modification. The Examiner is asking a person skilled in the art to make a mental jump, in order to be able to allow for such modification.

It is further noted that Yokoyama effectively teaches away from having any light transmissive structure in front of its LED array, since its light source device specifically adopts a purely reflective light guide block, which does not operate in a manner transmitting light through a transmissive light guide material. There is therefore no suggestion anywhere to modify Cho, but instead only teaching away from using a two dimensional array of point light sources with the linear array of convex surfaces in Cho.

As can be appreciated from the foregoing discussions, the cited references do not contain any suggestion (express or implied) that they be combined, or that they be combined in the manner suggested only by the Examiner. In fact, each reference is individually complete and functional in itself in accordance with the respective intended structural designs, so there would be no reason to use parts from or add or substitute parts to any reference. The references take mutually exclusive paths and reach different solutions to different problems that were intended to be overcome by the respective references. As also noted above, those skilled in the art would find it physically impossible or infeasible to combine the references in the manner suggested only by the Examiner, and/or if combined, the references would produce an inoperative combination. According to MPEP §2145 X.D.3, the totality of the prior art must be considered, and proceeding contrary to accepted wisdom in the art is evidence of nonobviousness. It would be necessary to make modifications, not taught in the prior art, in order to combine the references in the manner suggested only by the Examiner. Further, the combination suggested only by the Examiner requires a progress series of many separate modifications that are too awkward to be considered obvious to combine such. The references hence effectively teach away from each

other, and hence it would not be logical to combine them. More particularly, the references themselves teach away (expressly or by implication) from the various and progressive combinations suggested by the Examiner to obtain the inventive structure. Since the references effectively teach away from each other, it would not be logical to combine any of them, much less to modify Funamoto in view of Yokoyama and Cho in the manner suggested by the Examiner. According to MPEP §2145 X.D.2, it is improper to combine references where the references teach away from their combination.

It appeared that the Examiner cherry-picked selected structures from various non-analogous devices in the cited references, disregarding the fact that the references themselves do not teach or suggest, and in fact teach or suggest against, the combination proposed by the Examiner. The Examiner relied upon the allegation that all aspects of the claimed invention were individually known in the art to support the allegation that the proposed modifications of the prior art to meet the claimed invention would have been within the ordinary skill of the art at the time the claimed invention was made. Such is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references, as explained in MPEP §2143.01. Instead, the proper obviousness inquiry is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. As demonstrated above, such objection reason is lacking, given the many objective reason not to combine the teachings of the references.

Applicant further notes that some of the additional considerations, while not specifically recited in the claims, are nonetheless relevant to the recited structure, and are therefore relevant

to an obviousness inquiry. For an obviousness inquiry, these additional considerations would be relevant to a determination of whether it would have been obvious to combine the references in the manner proposed by the Examiner, based on objective suggestion or motivation by the prior art when viewed as whole.

Accordingly, the references should not have been combined in the first place, and any such combination would be the direct result of impermissible hindsight reconstruction, made possible only by the disclosure of the present invention. Claims 27-52 are therefore not rendered obvious by Funamoto in view of Yokoyama and Cho.

CONCLUSION

In view of all the foregoing, Applicants respectfully submit that the claims pending in this application are patentable over the references of record and are in condition for allowance. Such action at an early date is earnestly solicited. **The Examiner is invited to call the undersigned representative to discuss any outstanding issues that may not have been adequately addressed in this response.**

Respectfully submitted,



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